# FEDERAL AVIATION ADMINISTRATION

## **AIR TRAFFIC ORGANIZATION**

## SYSTEM OPERATIONS SERVICE UNIT



**Midwest Airspace Enhancement (MASE)** 

**Overview of System Changes** 

**April 4, 2006 Version 1.2** 

#### TABLE OF CONTENTS

PROGRAM OVERVIEW
Description
Schedule5
Objectives of MASE
MASE Design Modifications
Expected Benefits of MASE
MASE Training5
MASE AIRSPACE DESIGN MODIFICATIONS
New and Modified Routes
Examples of Airspace Design Changes
Standard Instrument Departures/Standard Terminal Arrival Routes
Preferred Routes6
Airspace Design Modifications (Graphic)
New Sectors and Sector Boundary Changes to Accommodate New Route Structure 7
New Sectors (Graphic)
Specific Detail – ZOB Ontario Sector
New Playbook Route
Modeling and Analysis
Analysis of Flight Distance Impacts
Analysis of Flight Delay Impacts
DTW DEPARTURES AND ARRIVALS
CLE DEPARTURES AND ARRIVALS
STANDARD TERMINAL APPROACH ROUTES (STAR)
GEMNI-STAR14

LLEEO-STAR	
PICES-STAR	16
WEEDA-STAR	17
ABERZ-STAR	18
CHARDON-STAR	19
HIMEZ-STAR	20
KEATN-STAR	21
STANDARD INSTRUMENT DEPARTURES (SID)	22
ALPHE-SID	22
AMRST-SID	23
CXR-SID	24
ERRTH-SID	25
FWA-SID	26
MAARS-SID	27
MOONN-SID	28
OBRLIN-SID	29
RID-SID	30
ROD-SID	31
SKY-SID	32
SAMPLE PREFERRED ROUTE MODIFICATIONS	33
MASE POINTS OF CONTACT	37
MASE ROUTING TABLES AND PREFERRED ROUTES	37

#### PROGRAM OVERVIEW

This document provides an overall description of NAS system changes resulting from implementation of the Midwest Airspace Enhancement in June 2006.

#### **Description**

The Midwest Airspace Enhancement (MASE) is a large scale integrated airspace redesign spanning airspace monitored and controlled by multiple FAA Air Route Traffic Control Centers (ARTCC) and FAA Air Traffic Organization Service Areas, involving significant changes in route design that will balance traffic flows and reduce congestion and complexity.

While the MASE airspace redesign provides improvements such as additional arrival routes and new departure routes for Detroit Metro operations, and new sectors in the Cleveland ARTCC (ZOB) and Indianapolis ARTCC (ZID) airspaces to accommodate new routings and further reduce complexity, the changes to airspace routes resulting from MASE also enable other airspace designs, including the Chicago Airspace Project, the NY/NJ/PHL Metropolitan Redesign, and new runways in the Great Lakes Corridor.

Although the MASE redesign provides benefit independent of these other projected system improvements, the benefits of these other projects will be reduced without the foundation improvements provided by the MASE redesign.

Implementing MASE will increase throughput, decrease departure delays, reduce arrival restrictions, and reduce workload complexity.

The Midwest Airspace Enhancement (MASE) represents a coordination and integration of several originally independent initiatives to enhance traffic flow efficiency through improved aircraft routing in various areas of the National Airspace System (NAS) where airspace utilization is monitored and managed by various FAA Air Route Traffic Control Centers (ARTCC).

The original routing improvement initiatives that are combined into MASE include:

- Route changes in Cleveland ARTCC (ZOB) and Indianapolis ARTCC (ZID)
  airspaces to provide new routes for Detroit Metro and Cleveland Metro operations
- Route changes in Atlanta ARTCC (ZTL) and Jacksonville ARTCC (ZJX) airspace to provide new routes for operations influenced by Inappropriate Altitude For Direction Of Flight (IAFDOF)
- Route changes in ZTL, ZID, Memphis ARTCC (ZME), and Chicago ARTCC (ZAU) to provide new routes for elimination of VXV transition to MACEY arrival into ATL
- Coordination of new routes in the Washington ARTCC (ZDC), Minneapolis ARTCC (ZMP), and Kansas City ARTCC (ZKC) airspaces

Design processes began at ZOB and ZID in 2000, with multi-Center modeling efforts conducted by MITRE/CAASD in 2001-2002. Design proposals were validated in 2004, reroute tables were completed in early 2005, and environmental analyses were conducted in 2003-2005.

#### **Schedule**

Implementation of the MASE airspace redesign is currently scheduled for June 8 2006.

#### **Objectives of MASE**

- Reduce complexity and congestion
- Reduce delays and restrictions
- Support new runways
- Enable future system improvements

#### MASE Design Modifications

- Additional SID and STAR Routes
- Additional Preferred Route Options
- Redesign of Existing Preferred Routs
- Modification and New Sector Design

#### **Expected Benefits of MASE**

- Increase in arrival throughput and decrease in departures delay at DTW resulting in \$7 million reduction annually in delay related costs
- Increased departure efficiency at CLE
- Reduction in arrival Miles in Trail restrictions currently originated at DTW and passed back through several Air Route Traffic Control Centers
- Reduction of workload complexity:
  - o ZID and ZOB arrival and departure interaction
  - o ZTL arrival traffic into ATL
  - o ZTL and ZJX IAFDOF coordination
- Foundation for future redesign:
  - o Additional ORD departure gates
  - o CVG arrivals and departure
  - o NY Metro arrival and departure routes

#### MASE Training

The audience for MASE training products will include a broad population of FAA Traffic Flow Management personnel as well as NAS users (including commercial, business, and general aviation users) who will be impacted and must comply with new traffic routing procedures.

Specifically, the FAA personnel receiving the training will include National Operations Managers, National Traffic Management Officers, Traffic Management Specialists, Directors of Tactical Operations, Traffic Management Officers, Supervisory Traffic Management Coordinators, and Traffic Management Coordinators.

#### MASE AIRSPACE DESIGN MODIFICATIONS

#### **New and Modified Routes**

- Standard Instrument Departures (SID) and Standard Terminal Arrival Routes (STAR) for DTW and CLE to allow easier access to and from the airports and facilitate additional traffic from new runways
- Preferred Routes in an effort to relieve complexity of en route environment
- Route Changes will be operational on June 8, 2006

#### **Examples of Airspace Design Changes**

#### Standard Instrument Departures/Standard Terminal Arrival Routes

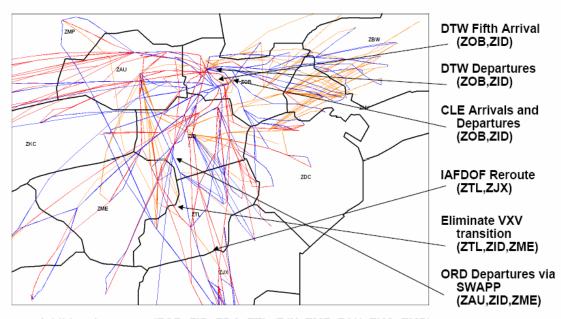
- DTW departures and arrivals
- CLE departures and arrivals

#### **Preferred Routes**

- From airports in Midwest to airports in East
- From airports in Midwest to airports in West
- From airports in Midwest to airports in South
- From airports in Midwest to airports in Midwest

#### **Airspace Design Modifications (Graphic)**

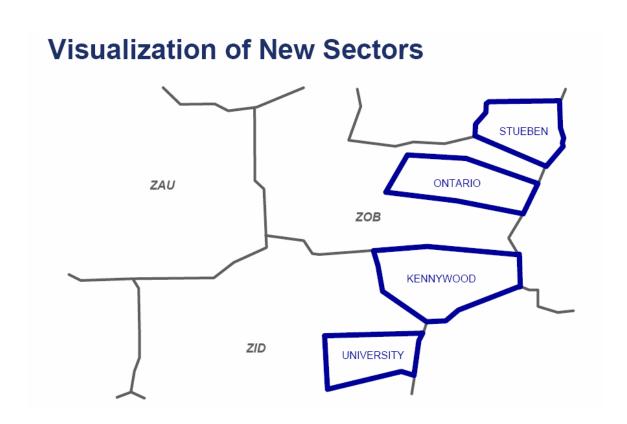
## **Airspace Design Modifications Graphic**



#### New Sectors and Sector Boundary Changes to Accommodate New Route Structure

- Two new sectors are currently operational (Kennywood and Steuben)
- Third new sector (Ontario) will become operational March 28, 2006
- Fourth new sector (University) and additional sector changes will be operational on June 8, 2006 along with new MASE routes

#### New Sectors (Graphic)

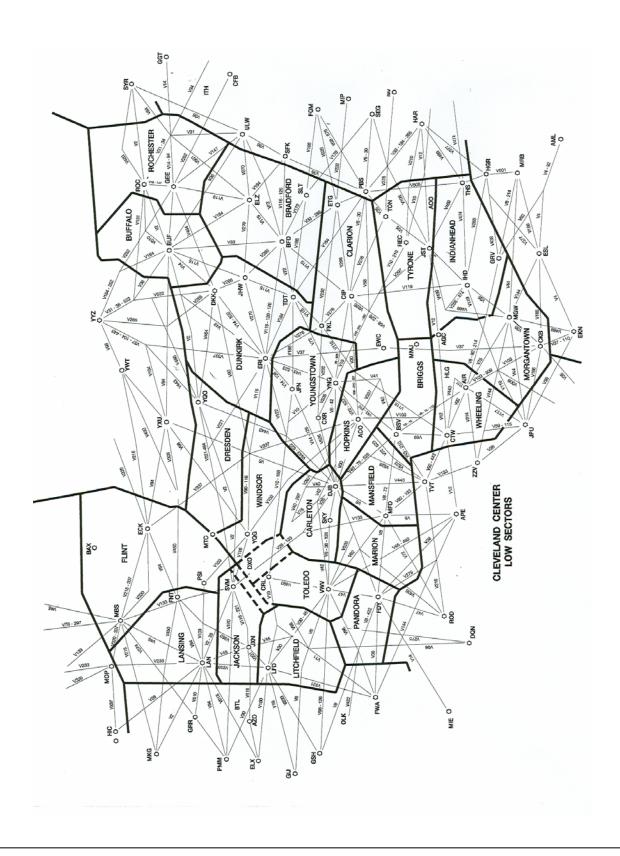


#### **Specific Detail – ZOB Ontario Sector**

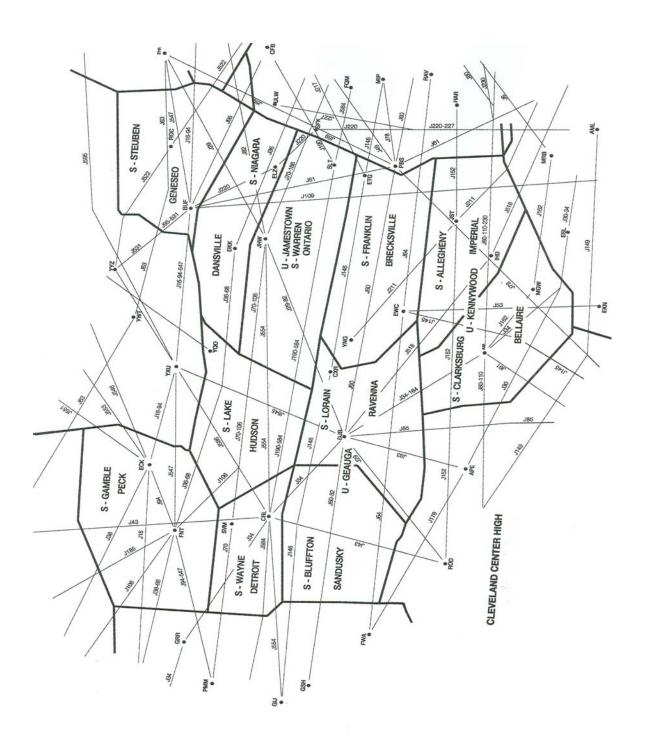
Operational: March 28, 2006

Opening the Ontario Sector required the re-stratification of four low sectors and three high sectors.

- DKK, BUF, ROC, and BFD Sector ceilings will be lowered from Fl 270 to FL230.
- DSV and GEE Sector bases will be lowered to FL240
- WRN Sector base will be raised to FL290.
- ONT Sector will mirror the WRN boundary and will assume FL280 from WRN and FL240-270 from DKK and BFD.



Ontario Sector (operational March 28, 2006): The ceiling altitude for Buffalo & Rochester Sectors in Area 3 and Dunkirk & Bradford Sectors in Area 7 lowers from FL270 to FL230



Ontario Sector boundary mirrors the Warren Sector boundary. Ontario Sector takes FL280 from Warren Sector and FL240-270 from Dunkirk and Bradford Sectors. Dansville and Geneseo Sectors in Area 3 lower their base altitude from FL280 to FL240. Warren Sector in Area 7 raises its base altitude from FL280 to FL290

#### **Controlled Departure Routes**

Revised Controlled Departure Routes (CDR) related to the Midwest Airspace Enhancement (MASE) will be completed and available May 13, 2006

#### **New Playbook Route**



#### **Modeling and Analysis**

MASE design was analyzed to identify operational effects on airspace and customers, including:

- Changes in delays due to reduced miles-in-trail
- Distance increases/decreases resulting from route changes

Human-in-the-loop (HITL) studies were also conducted to allow controllers to understand how route and sector modifications will affect workload.

## **Distance Analysis** Results

- Average distance difference across all flights affected by MASE is approximately 2nm
- The table shown is broken down by airlines with approximately 200 flights or more
  - Also included AWE, NKS, SKW, and USA

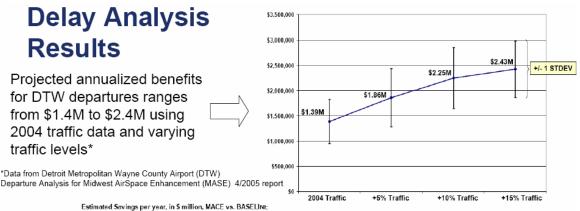
	Total	Average
	Aircraft	Distance
Airline	Count	Difference*
AAL	231	-1.4
AWE	32	4.3
BTA	653	1.6
COA	191	4.2
COM	495	3.6
DAL	531	0.9
EGF	278	0.2
FDX	20	1.4
FLG	219	1.5
Gen Av	236	2.7
MES	191	0.8
NKS	144	-7.0
NWA	1307	3.7
SKW	43	0.7
SWA	293	1.3
UAL	234	1.3
USA	91	3.8

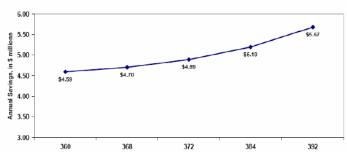
#### **Analysis of Flight Delay Impacts**

## **Delay Analysis** Results

Projected annualized benefits for DTW departures ranges from \$1.4M to \$2.4M using 2004 traffic data and varying traffic levels\*

\*Data from Detroit Metropolitan Wayne County Airport (DTW)





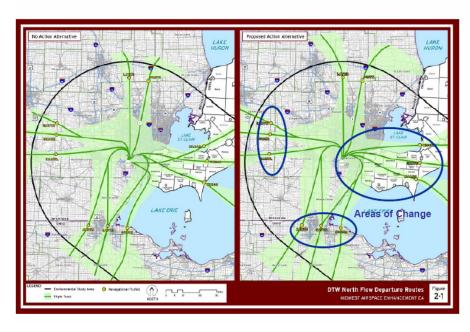
Arrival Count

Projected annualized benefits for DTW arrivals ranges from \$4.6M to \$5.7M using 2003 traffic data and varying traffic levels\*\*

\*\*Date from Midwest Airspace Capacity Enhancement (MACE) Detroit Metro (DTW) Arrival Delay Modeling 4/2004 report

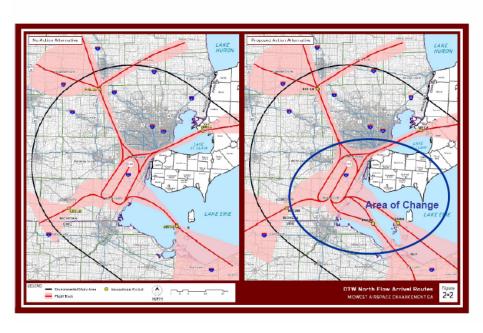
#### DTW DEPARTURES AND ARRIVALS

## **DTW Departures**



- •Eastern flows now have 3 departure routings
- •Southern flows now have 3 jet departure routings \*easternmost previously for props only
- •Western flows have an additional limited jet departure routing (northernmost route previously for props only)

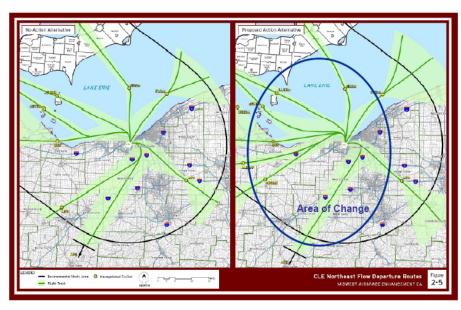
## **DTW Arrivals**



•The area circled shows the addition of the 5<sup>th</sup> arrival fix to DTW

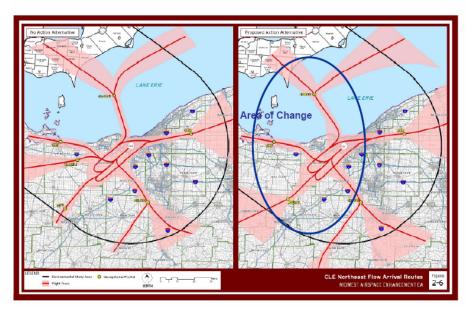
#### **CLE DEPARTURES AND ARRIVALS**

## **CLE Departures**



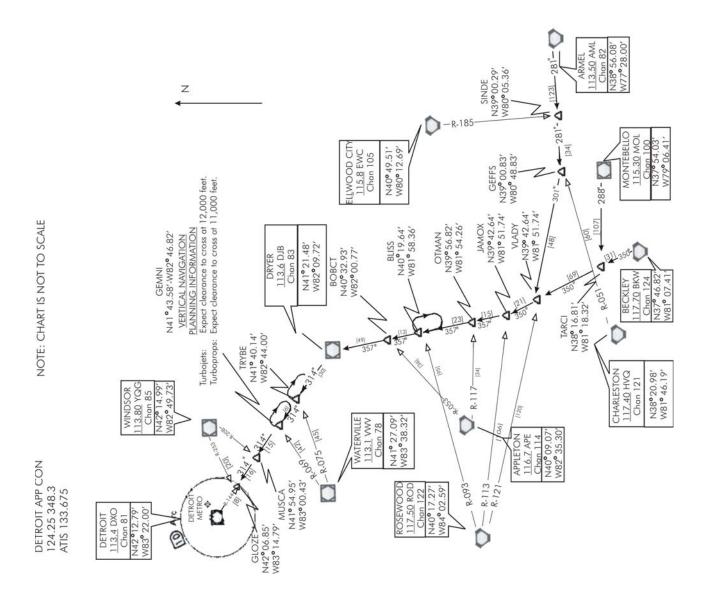
- •Southern and Western departure routes were changed to optimize access to the overhead streams and to reduce time to climb to altitude.
- •Interaction with DTW departures will allow for real time altitude coordination between ZOB and ZID and less reliance on static letter of agreement departure altitudes.

### **CLE Arrivals**



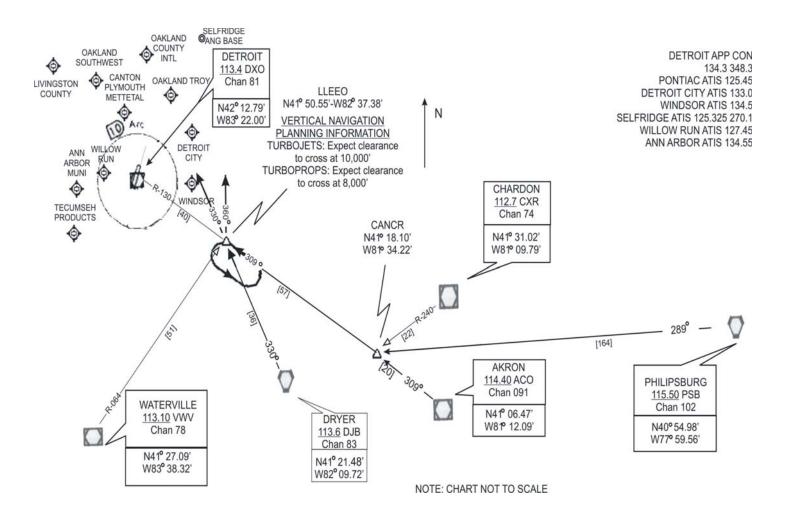
- •The arrival flows were changed to eliminate overlap from DTW departure flows. These overlaps caused DTW departures to adversely effect the CLE arrivals.
- •The arrival flows were also optimized to insure they would not effect the new CLE departure flows.

#### STANDARD TERMINAL APPROACH ROUTES (STAR)

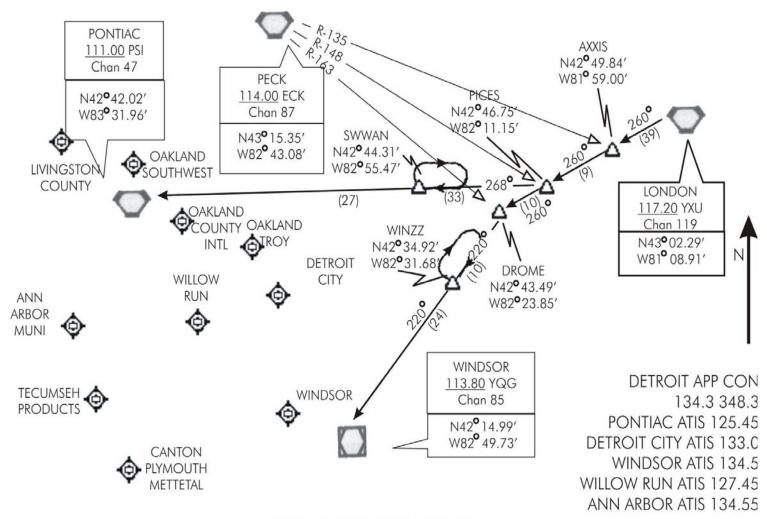


#### **GEMNI-STAR**

#### **LLEEO-STAR**

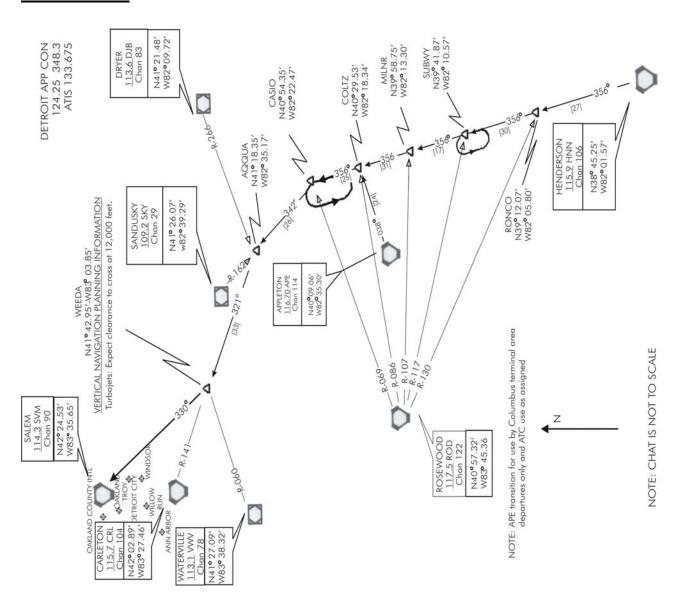


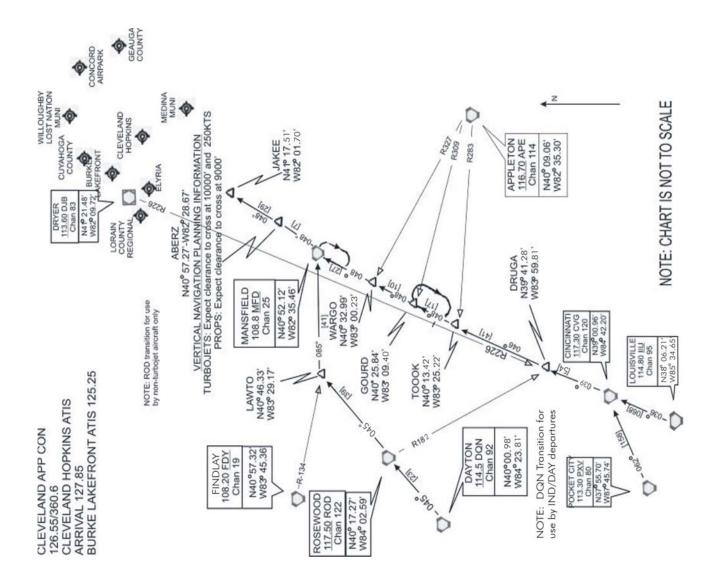
#### **PICES-STAR**



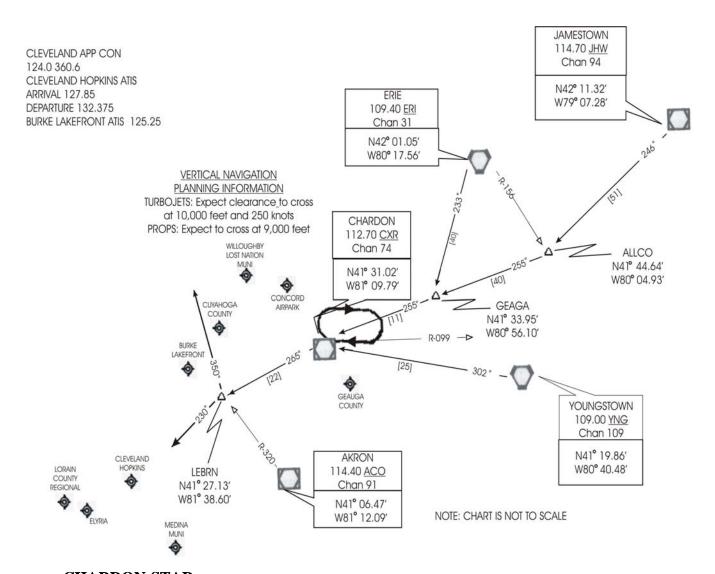
NOTE: CHART NOT TO SCALE

#### **WEEDA-STAR**



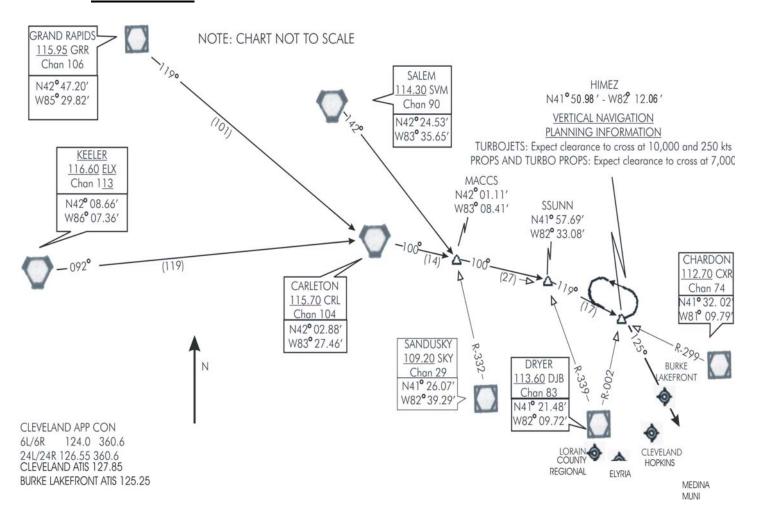


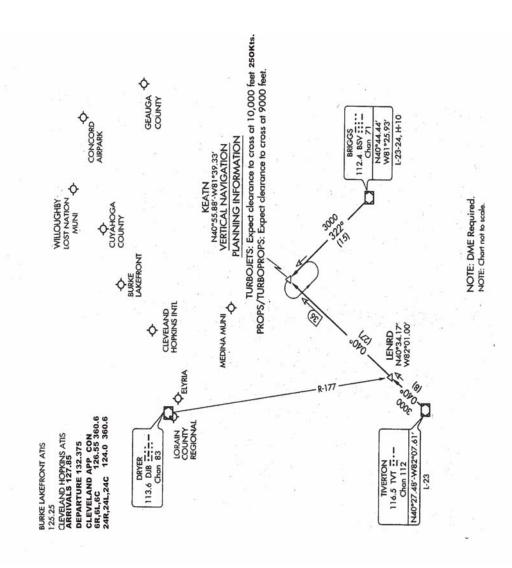
**ABERZ-STAR** 



#### **CHARDON-STAR**

#### **HIMEZ-STAR**

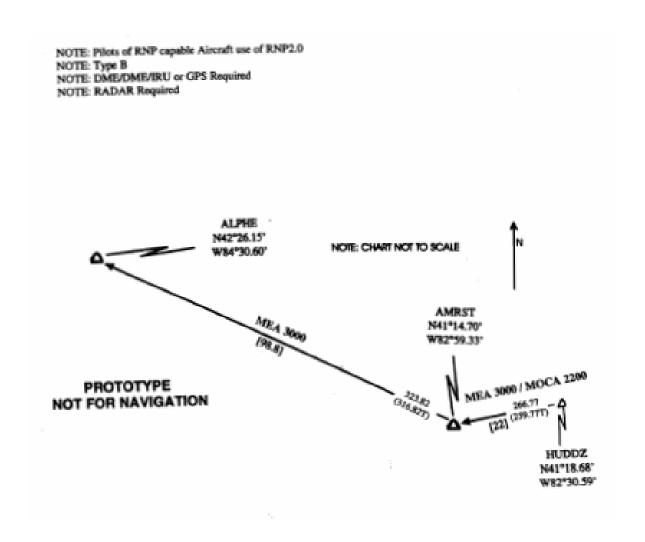




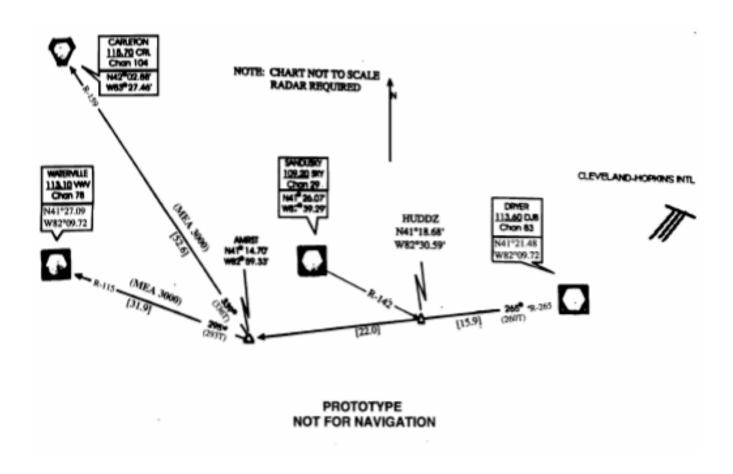
#### **KEATN-STAR**

#### STANDARD INSTRUMENT DEPARTURES (SID)

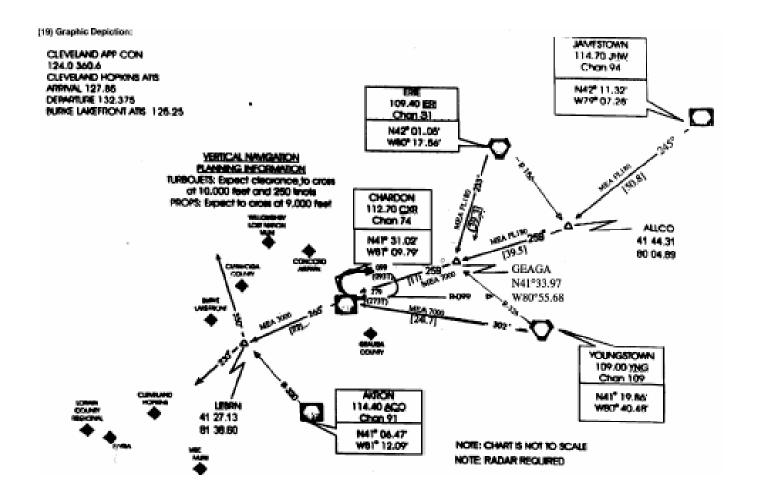
#### **ALPHE-SID**



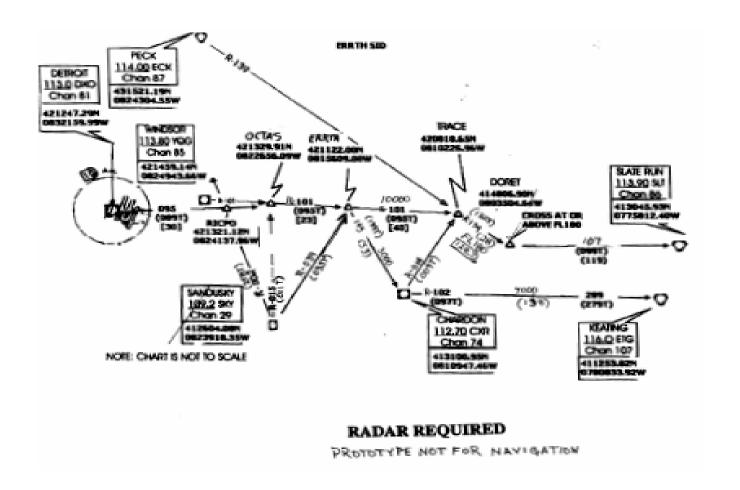
#### **AMRST-SID**



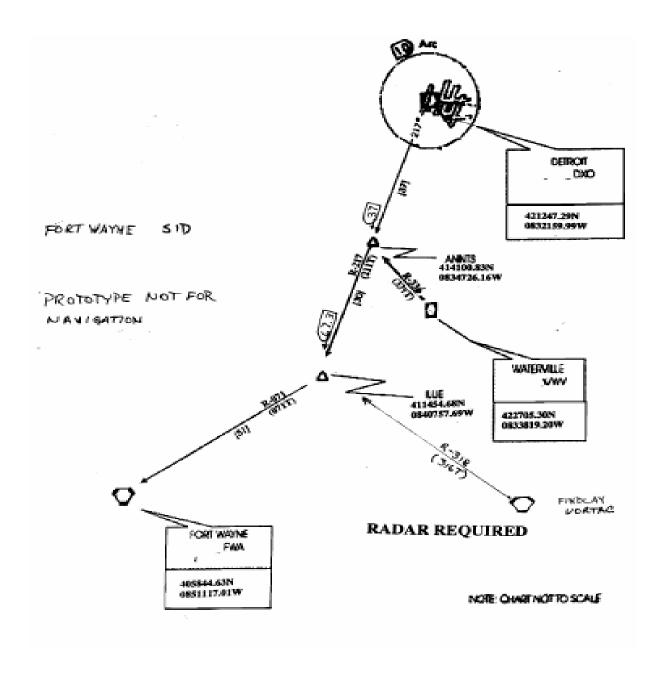
#### **CXR-SID**



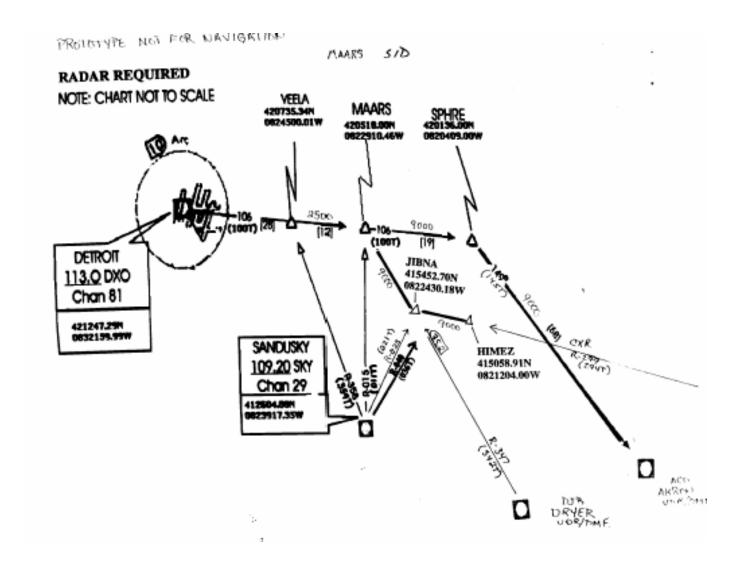
#### **ERRTH-SID**



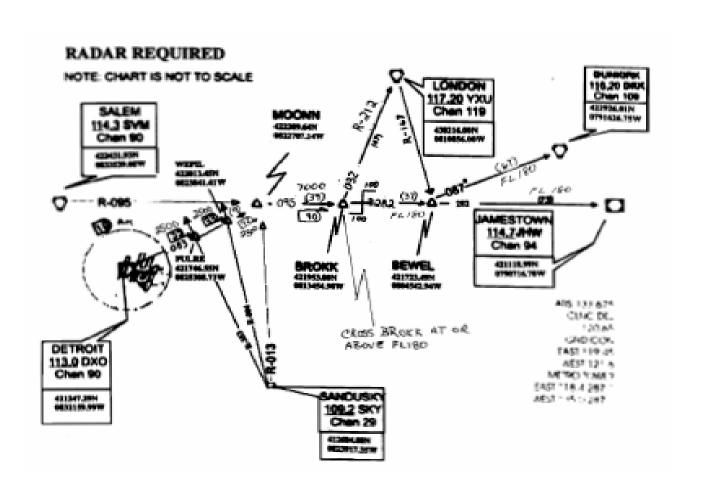
#### **FWA-SID**



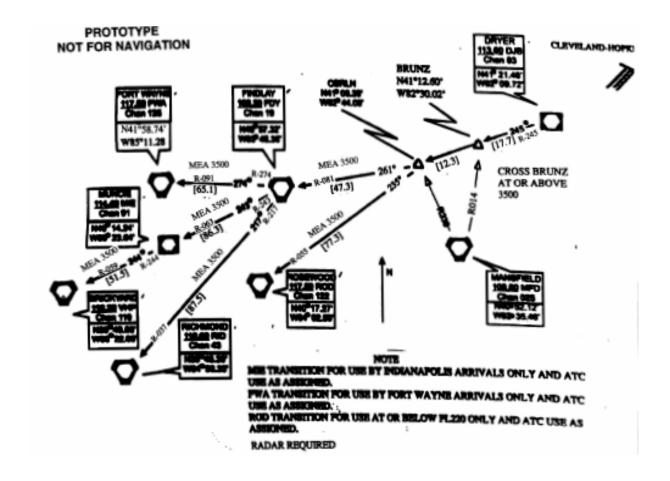
#### **MAARS-SID**



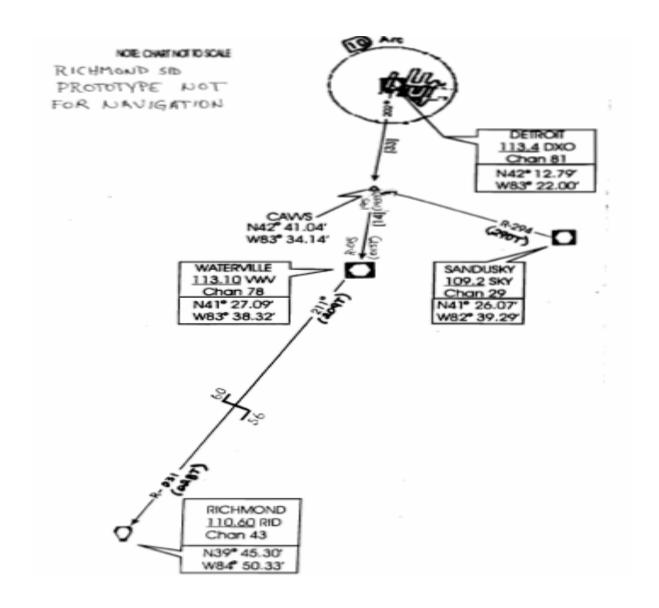
#### **MOONN-SID**



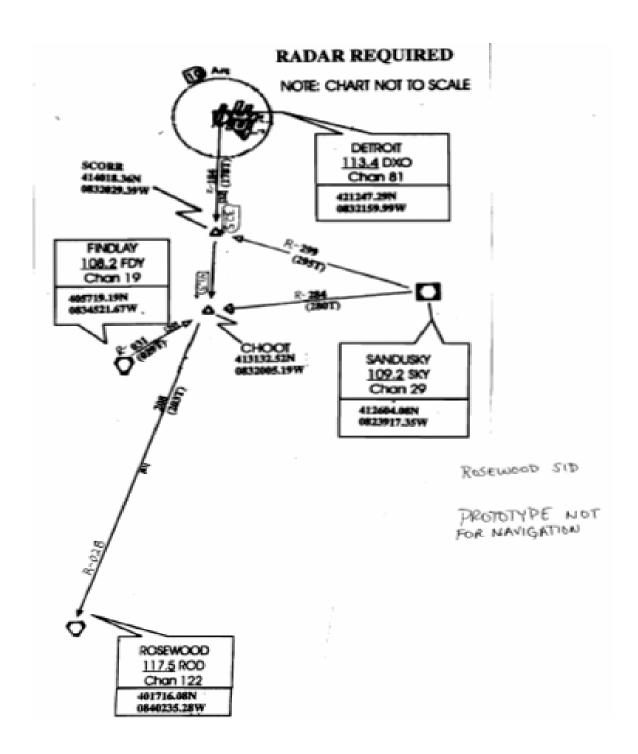
#### **OBRLIN-SID**



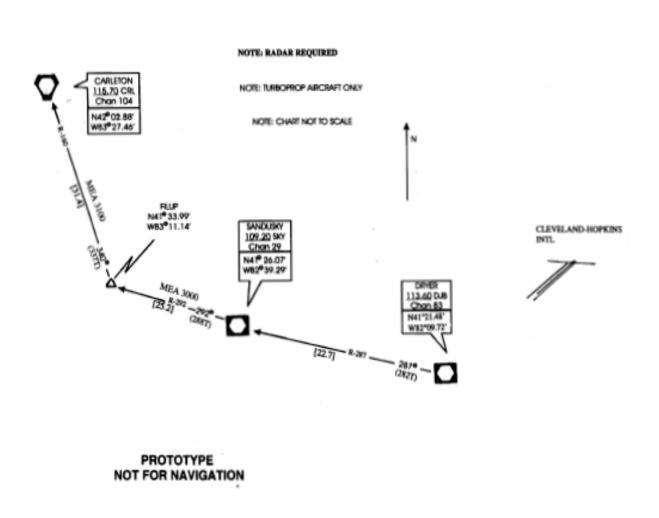
#### **RID-SID**



#### **ROD-SID**



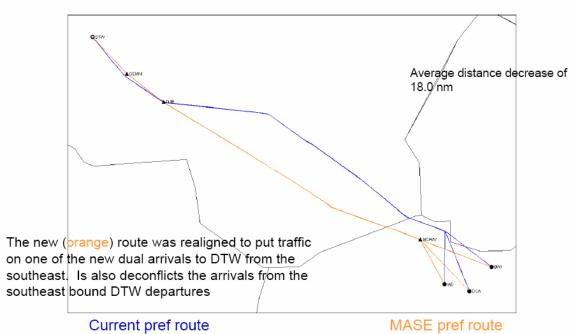
#### **SKY-SID**



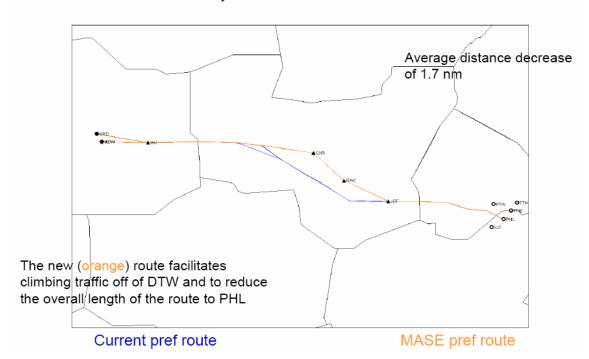
#### SAMPLE PREFERRED ROUTE MODIFICATIONS

(Complete preferred route modifications are found in MASE route tables)

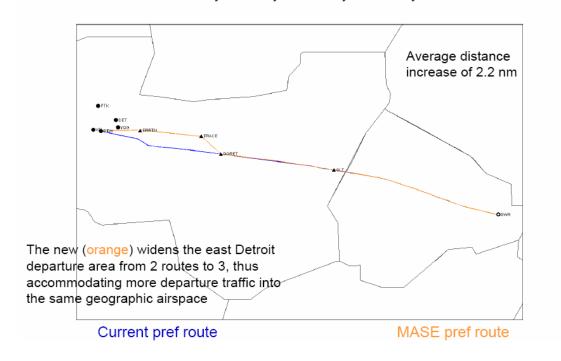




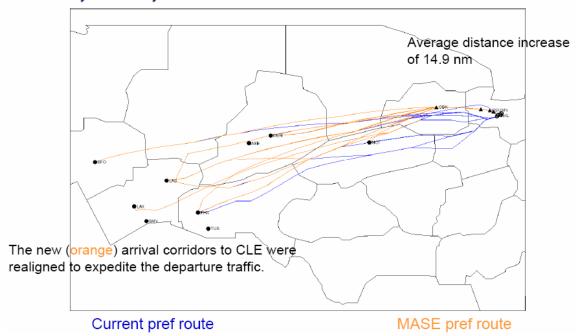
## Route 75: ORD, MDW to PHL



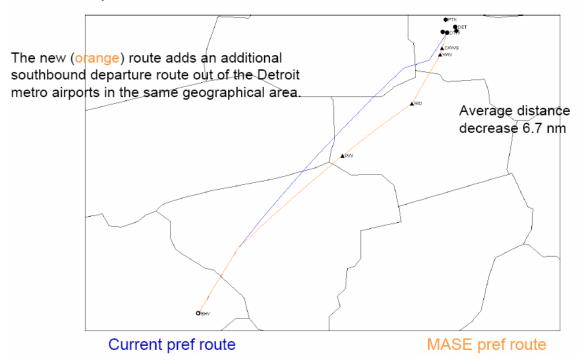
## Route 73: DTW, YIP, PTK, DET, YQG to EWR



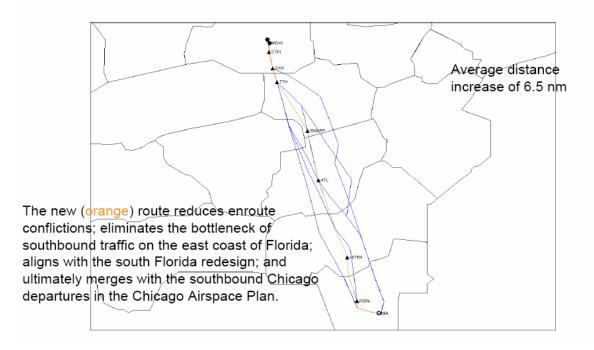
## Route 85: SAN, LAX, LAS, DEN, MCI, PHX, SFO, ASE, TUS to CLE



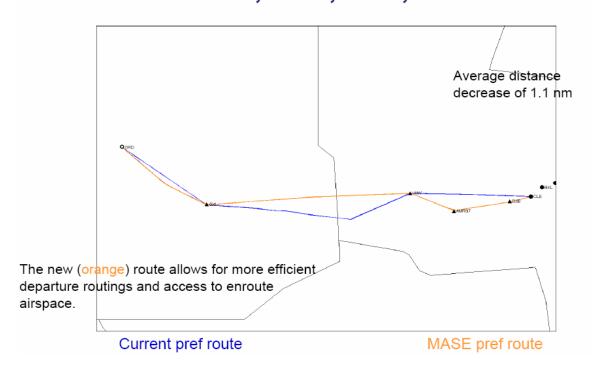
## Route 48: DTW, YIP, PTK, DET, YQG to HOU, SHV



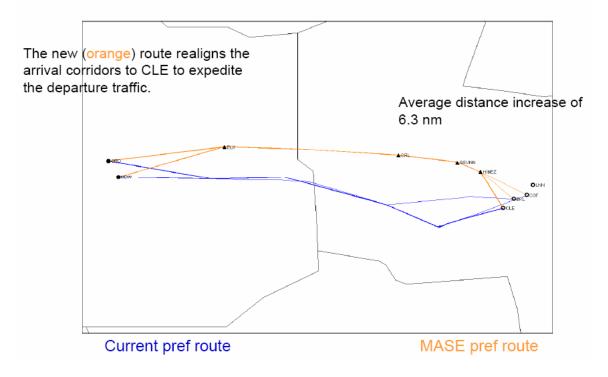
## Route 149: ORD, MDW to MIA



## Route 101: CLE, CGF, BKL, LNN to ORD



## Route 81: MDW, MLI, ORD, RFD to CLE



#### MASE POINTS OF CONTACT

MASE Project Manager	Marvin Burnette	404-305-5565	Marvin.burnette@faa.gov
Contract Support	Val Wendling	703-983-3283	Wendling@mitre.org
Contract Support	Gary Klingler	330-725-4405	Gary.ctr.klingler@faa.gov

Facility	Name	Phone No.	Email
CLE	Pete DiFranco	216-898-2025	Pete.difranco@faa.gov
DTW	Marcia Boliard	734-955-5004	Marcia.boliard@faa.gov
ZAU	Randy Schulz	630-906-8501	Randy.schulz@faa.gov
ZBW	Pete Pasquale	603-879-6858	Peter.p.pasquale@faa.gov
ZDC	Ken Ware	703-771-3504	Kenneth.ware@faa.gov
ZID	Doug Kelley	317-247-2275	Douglas.j.kelley@faa.gov
ZJX	Rob Draughon	904-549-1570	Robert.draughon@faa.gov
ZJX	Howard Callon	904-549-1574	Howard.callon@faa.gov
ZKC	Jay Gaumer	913-254-8447	Jay.gaumer@faa.gov
ZKC	Tom Wray	913-254-8460	Tom.wray@faa.gov
ZME	Mona Homan	901-368-8530	Mona.s.homan@faa.gov
ZMP	Connie Hreha	651-463-5903	Connie.hreha@faa.gov
ZNY	Mike Golden	631-468-1010	Michael.golden@faa.gov
ZNY	Bob Ocon	631-468-1015	Robert.ocon@faa.gov
ZOB	Bill Wallis	440-774-0770	William.w.wallis@faa.gov
ZTL	George Peurifoy	770-210-7646	George.peurifoy@faa.gov
ZTL	Tim Chambers	770-210-7657	Tim.chambers@faa.gov

#### MASE ROUTING TABLES AND PREFERRED ROUTES

Amended routing and preferred routes associated with the Midwest Airspace Enhancement (MASE) become effective June 8, 2006.

This detailed routing information is published separately and available for download on the web at <a href="https://www.fly.faa.gov/tfmlearning">www.fly.faa.gov/tfmlearning</a>.